

WE CLAIM:

- 1     1.     An isolated nucleic acid encoding a lepidopteran glutamate-gated chloride channel.
- 1     2.     The isolated nucleic acid of Claim 1 wherein the nucleic acid is DNA or RNA.
- 1     3.     The isolated nucleic acid of Claim 1 wherein the nucleic acid comprises a nucleotide  
2         sequence encoding the amino acid sequence of SEQ ID NO: 14.
- 1     4.     The isolated nucleic acid of Claim 1 wherein the nucleic acid comprises the nucleotide  
2         sequence of SEQ ID NO: 13.
- 1     5.     The isolated nucleic acid of Claim 1 wherein the nucleic acid comprises nucleotides 144  
2         through 1484 of SEQ ID NO: 13.
- 1     6.     The isolated nucleic acid of Claim 1 wherein said nucleic acid has at least 80% sequence  
2         identity to the nucleic acid of Claim 5.
- 1     7.     The isolated nucleic acid of Claim 1 wherein said nucleic acid has at least 90% sequence  
2         identity to the nucleic acid of Claim 5.

- 1 8. The isolated nucleic acid of Claim 1 wherein said nucleic acid has at least 95% sequence  
2 identity to the nucleic acid of Claim 5.
- 1 9. A vector comprising an isolated nucleic acid encoding a lepidopteran glutamate-gated  
2 chloride channel.
- 1 10. The vector of Claim 9 wherein the isolated nucleic acid comprises a nucleotide sequence  
2 encoding the amino acid sequence of SEQ ID NO: 14.
- 1 11. The vector of Claim 9 or 10 further comprising a promoter operably linked to the isolated  
2 nucleic acid.
- 1 12. A host cell comprising the vector of Claim 9 or 10.
- 1 13. A host cell comprising the vector of Claim 11.
- 1 14. A host cell expressing a recombinant lepidopteran glutamate-gated chloride channel.
- 1 15. A membrane preparation comprising a recombinant lepidopteran glutamate-gated  
2 chloride channel.

- 1 16. A method of making a recombinant lepidopteran glutamate-gated chloride channel  
2 comprising introducing a nucleic acid encoding a lepidopteran glutamate-gated chloride  
3 channel into a host cell and culturing the host cell under conditions suitable for  
4 expressing the nucleic acid.
- 1 17. The method of Claim 16 wherein the nucleic acid comprises a nucleotide sequence  
2 encoding the amino acid sequence of SEQ ID NO: 14.
- 1 18. The method of Claim 16 wherein the host cell is an insect cell.
- 1 19. An amphibian oocyte comprising an isolated nucleic acid encoding a lepidopteran  
2 glutamate-gated chloride channel.
- 1 20. An amphibian oocyte expressing a lepidopteran glutamate-gated chloride channel.
- 1 21. The oocyte of Claim 20 which is a *Xenopus* oocyte.
- 1 22. The oocyte of Claim 20 wherein the lepidopteran glutamate-gated chloride channel has  
2 the amino acid sequence of SEQ ID NO: 14.

1     23.     A method of identifying an agent that modulates the activity of a lepidopteran glutamate-  
2             gated chloride channel comprising applying a putative agent to a lepidopteran glutamate-  
3             gated chloride channel in the presence of chloride ions and measuring flux of chloride  
4             through the channel, wherein flux of chloride is indicative of an agent that modulates  
5             activity.

1     24.     The method of Claim 23 wherein the chloride channel is in a host cell, a membrane  
2             preparation or an oocyte.

1     25.     The method of Claim 23 wherein the chloride channel comprises the amino acid sequence  
2             of SEQ ID NO: 14.

1     26.     A method of identifying an agent that modulates the activity of a lepidopteran glutamate-  
2             gated chloride channel comprising applying glutamate to a lepidopteran glutamate-gated  
3             chloride channel in the presence of chloride ions and measuring chloride flux; applying  
4             the putative agent and glutamate to a lepidopteran glutamate-gated chloride channel in the  
5             presence of chloride ions and measuring chloride flux; and comparing chloride flux in the  
6             presence and absence of the putative agent, wherein a change in chloride flux in the  
7             presence of the putative agent is indicative of an agent that modulates the activity of a  
8             lepidopteran glutamate-gated chloride channel.

- 1     27.     The method of Claim 26 wherein the chloride channel is in a host cell, a membrane  
2             preparation or an oocyte.
- 1     28.     The method of Claim 27 wherein the chloride channel comprises the amino acid sequence  
2             of SEQ ID NO. 14.
- 1     29.     A method of identifying an agent that binds to a lepidopteran glutamate-gated chloride  
2             channel comprising incubating a recombinant glutamate-gated chloride channel with a  
3             radiolabeled ligand that specifically binds to the channel and a putative agent, and  
4             measuring the ability of the agent to inhibit specific binding of the labeled ligand to the  
5             channel.
- 1     30.     An agent identified by the method of Claim 23, 26, or 29.
- 1     31.     A composition comprising a recombinant lepidopteran glutamate-gated chloride channel  
2             in a cell membrane.
- 1     32.     The composition of Claim 31 wherein the lepidopteran glutamate-gated chloride  
2             comprises the amino acid sequence of SEQ ID NO: 14.

- 1     33.     The composition of Claim 31 wherein the membrane is in the form of a membrane  
2             preparation, an intact cell, or an oocyte.
- 1     34.     A kit comprising a first container containing a recombinant lepidopteran glutamate-gated  
2             chloride channel in a cell membrane.
- 1     35.     The kit of Claim 34 wherein the lepidopterin glutamate-gated chloride channel comprises  
2             the amino acid sequence of SEQ ID NO: 14.
- 1     36.     The kit of Claim 34 wherein the membrane is in the form of a membrane preparation, an  
2             intact cell, or an oocyte.
- 1     37.     The kit of Claim 34 further comprising a second container containing glutamate.